Chapter 7, Solution 7.

When the switch is at position A, the circuit reaches steady state. By voltage division,

$$v_o(0) = \frac{40}{40+20}(12V) = 8V$$

When the switch is at position B, the circuit reaches steady state. By voltage division,

$$v_o(\infty) = \frac{30}{30+20}(12V) = 7.2V$$

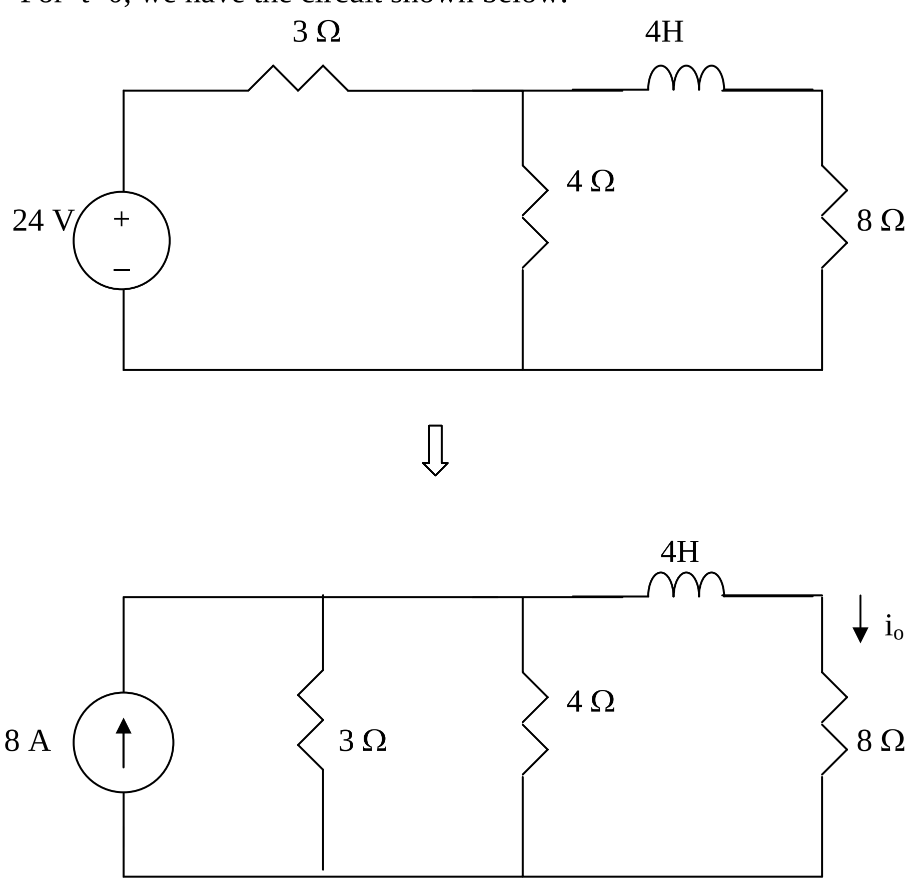
$$R_{Th} = 20k // 30k = \frac{20x30}{50} = 12k\Omega$$

$$\tau = R_{Th}C = 12x10^3 x2x10^{-3} = 24s$$

$$v_o(t) = v_o(\infty) + [v_o(0) - v_o(\infty)]e^{-t/\tau} = 7.2 + (8-7.2)e^{-t/24} = \underline{7.2 + 0.8e^{-t/24} \quad V}$$

Chapter 7, Solution 11.

For t<0, we have the circuit shown below.



3//4= 4x3/7=1.7143

$i_o(0^-) = \frac{1.7143}{1.7143+8}(8) = 1.4118$ A

For t >0, we have a source-free RL circuit.

$\tau = \frac{L}{R} = \frac{4}{4+8} = 1/3$

$$i_o(t) = i_o(0)e^{-t/\tau} = \underline{1.4118e^{-3t} \text{ A}}$$

Chapter 7, Solution 42.

(a) $v_o(t) = v_o(\infty) + \left[v_o(0) - v_o(\infty) \right] e^{-t/\tau}$

$v_o(0) = 0, \qquad v_o(\infty) = \frac{4}{4+2}(12) = 8$

$\tau = R_{eq}C_{eq}, \qquad R_{eq} = 2 \,||\, 4 = \frac{4}{3}$

$\tau = \frac{4}{3}(3) = 4$

$v_o(t) = 8 - 8e^{-t/4}$

$v_o(t) = \underline{\mathbf{8(1 - e^{-0.25t})\ V}}$

(b) For this case, $v_o(\infty) = 0$ so that

$v_o(t) = v_o(0)e^{-t/\tau}$

$v_o(0) = \frac{4}{4+2}(12) = 8, \qquad \tau = RC = (4)(3) = 12$

$v_o(t) = \underline{\mathbf{8e^{-t/12}\ V}}$

Chapter 7, Solution 59.

Let I be the current through the inductor.

For t < 0, $v_s = 0$, $i(0) = 0$

For t > 0, $R_{eq} = 4 + 6 \| 3 = 6$, $\tau = \frac{L}{R_{eq}} = \frac{1.5}{6} = 0.25$

$$i(\infty) = \frac{2}{2+4}(3) = 1$$

$$i(t) = i(\infty) + \left[i(0) - i(\infty) \right] e^{-t/\tau}$$

$$i(t) = 1 - e^{-4t}$$

$$v_o(t) = L\frac{di}{dt} = (1.5)(-4)(-e^{-4t})$$

$$v_o(t) = \underline{6e^{-4t}u(t)\ \text{V}}$$